and wrong.] [First, INEEL's mission is to make waste forms, not to dispose of them.] [Second, the EIS suggests that INEEL's ~5,000 m^3 of HLW (today's calcines plus the additional 500-800 m^3 that could be made from SBW if it were to be efficiently calcined) will create 13,000 m^3 of "grout". Based upon my experience in grouting INEEL calcines, that figure is probably ~30% high.] [Third, and much more important, the "supplementary information" in the booklet on the table last night (the necessary figures weren't in the *EIS* itself) indicates that DOE is still unable to grasp the fact that disposal will be an incremental cost[7] in other words, that the cost of disposal will *not* be directly proportional to the geometric volume of waste forms.] [Why? 1) Formal analyses have repeatedly concluded that the transport of waste forms to a repository will represent a small fraction of total management cost irrespective of their volumes; 2) today's official hypothetical HLW repository site, Yucca Mountain (YM), is large enough (several cubic miles - several tens of billions of cubic meters) to accommodate any type of material(s) that DOE might choose to make from its reprocessing wastes; 3) YM's "size" is defined in units proportional to the amount of radionuclides to be buried there (the equivalent of that in 70,000 "metric tons of heavy metal"), not the waste's geometric volume; 4) the drilling/boring equipment necessary to create storage volume in it is already paid for; 5) SANDIA's "1994 Performance Assessment" indicates that all of INEEL's reprocessing waste adds up to only 320 "metric tons of heavy metal" - 0.46% of YM's capacity; and, of course, 6) YM is going to cost US taxpayers billions of dollars whether or not any real waste is ever buried there – like all DOE facilities, the cost of actually using YM for its intended purpose will add only a relatively small *incremental* cost.]

[Third, and finally, the same supplementary information also indicated that the actual processing of ICPP/INTEC waste into finished waste forms via "Direct Cement" would be about as expensive as the "planning approach" (separation/vitrification). That's just plain hogwash – the NAS has produced several reports that point out the relative cost effectiveness of cementitious solidification and cost is one of the main reasons why the UK chose to treat its "historic" reprocessing waste that way.] [Also, let's not forget that one of the primary goals of "separations" is to reclassify waste so that a higher fraction of can be grouted instead of vitrified ('cause it's cheaper).]

[Considering the degree of "command influence" that goes into the production of DOE-EM technical reports (often reflected by the deliberate omission of data, literature citations, etc., inconsistent with a desired conclusion, see footnote 5), I'm not really surprised how the EIS characterizes "direct cement".]

[Here's why a properly implemented "Direct Cement" alternative would have low environmental impact. First, let's define "properly". I've consistently advocated that it be implemented in such a way that **all** of ICPP/INTEC's waste regardless of "classification" is converted to the same type of waste form and goes to the same repository.[8] That's not the way the EIS interprets it; its authors propose making a large separate LLW waste stream that's apt to end being left in Idaho – an unnecessary assumption that makes this option much less attractive to stakeholders.] A one-process/one-waste form/one-repository management scenario would be much simpler than any of the other alternatives that would keep the promises made to stakeholders. Simplicity means less equipment, fewer personnel, less chemicals, less paperwork, less confusion, fewer lawyers, etc., etc., - all characteristics that tend to make doing things less "impactful" to both the environment and the taxpayer's pocketbook.

[Our mission is simply to render ICPP/INTEC reprocessing waste ready for transport to a repository that the Federal Government has promised to provide and to then clean up the place, period. It is not to "make work" for another couple of generations of DOE/contractor/subcontractor/regulatory personnel or to justify poor decisions made elsewhere with respect to implementing repositories, categorizing radwastes, or rendering them ready for transport.] [My assumptions are that, 1) there's plenty of suitable "Federal

[7] The NAS Panel also pointed this out – and then went on to suggest that it's unwise to base a choice of HLW solidification technology on guesses about what it might cost to dispose of waste forms several decades off in the future.

[8] If reasonable attention is paid to minimizing the solids content of the liquids generated in cleaning up the place (termed NGLW in this EIS), the amount of radioactive "ash" that would be produced by drying/calcining those liquids will be very small with respect to that represented by today's calcines and SBW. Consequently, I propose(d) that these liquids be processed/disposed-of in exactly the same manner – no additional equipment, repositories, assumptions, or paperwork would be required.

Land" available (notably at the NTS) for a practical repository for defense-type reprocessing waste[9] {meaning one that is not situated over a huge aquifer (INEEL) and which doesn't assign a phony premium to "volume reduction" (YM)}, 2) the politicians who can decide to implement such a repository will eventually do so, 3) cement-solidified calcine would meet the "letter of the law" (10CFR-60 & 40CFR-191) as a HLW disposal form, and, 4), that until a suitable repository actually materializes, we should simply emulate the UK's approach to "historic" reprocessing waste management.

[Concrete-making is intrinsically safer than is either glass-making or HIPing (it's done "wet" - generates less dust - and requires much lower temperatures) and is much easier/cheaper to do on an appropriate (large) scale. The improvements that I and my academic colleagues at PSU have recommended {"hydroceramic" (HC) rather than Portland cement–based grout formulations and the calcination (incineration) of everything that would be rendered more suitable for cementitious solidification by doing so} are to ensure production of top-quality products – materials distinctly more durable than those which BNFL has made out of the UK's "historic" waste and probably also superior to typical radwaste-type glasses. The "Lead lab" should make the DOE Complex's best waste forms.]

[BNFL has recently become a prominent player in the US radwaste technology marketplace because it has been able to leverage its tangible successes at home to successfully compete with US-owned firms (many of whose employees work at DOE sites) for US tax dollars.] [A cornerstone of its reputation is that it devised a practical way to make the UK's "historic reprocessing waste" road-ready and then saw the project through to completion – all done via "direct cement". US taxpayers would be well-served if USDOE would permit its contractors to apply a version of the same technology to its wastes.]

"Direct Cement" makes especially good sense at INEEL for the following reasons:

1) [INEEL has not yet formally committed itself to any particular "preferred alternative".]
2) [Because INEEL calcines do not contain excessive concentrations of soluble salts, it would be possible to satisfy the HC "sodalite formulation" rule-of-thumb with high waste loadings.]
3) [Since two of the three elements making up HC binder phases (Na & Al) are high-percentage constituents of INEEL calcines, there is no need to separate them (or anything else) prior to solidification. This means that everything would be prepared for offsite disposal – the expressed wish of local stakeholders. {A primary goal of the "volume reduction" practiced at WVDP and SRS is to transfer those elements to "low level" fractions that aren't vitrified.}]
4) [Simple changes to the existing calcination facility would permit it to efficiently calcine the remaining liquid reprocessing waste – either by itself or (preferably) after it's been slurry-mixed with existing calcines.]
5) [It would also provide a good way to deal with other INEEL radwastes. For example, INEEL must find some way to dispose of ~1000 metric tons of radioactive NaOH generated by reacting metallic sodium reactor coolant with water. Since this just happens to be the same amount of "activator" that would be required to turn ICPP/INTEC's calcines into HC concrete,

[9] Its decision to confound disposal of its own waste with that produced by the commercial nuclear power industry constitutes another reason why the US Federal Government has failed to honor its promises to Idaho (the first official promise to prepare our waste for disposal said it'd be done by 1980). Due to DOD insistence that DOE's civilian waste management responsibilities not interfere with its own interests at NTS, the Federal government chose to "withdraw" another ~600 km^2 of land from Nevada for today's official HLW repository modeling exercise (YM). This plus the assumption that *all* commercially-produced HLW is to be sent there engenders enough litigation to indefinitely block implementation of that repository – which means that linking these problems causes total paralysis. The most reasonable place for the Federal Government to site a repository dedicated to cold-war defense-type waste is at its cold-war defense-type test range, the Nevada Test Site (NTS). The NTS makes good sense because, a) it's already "federal land" (no new "withdrawal" required) ,b) it receives less precipitation than do other DOE sites, c) it possesses the USA's deepest water table, d) it has already been the object of more than thirty years worth of immediately relevant hydrogeological research, e) it's already been irredeemably "crapped up" by ~950 nuclear "events", and, finally, f) a little-publicized **real** example of a practical (cheap) repository for this sort of waste has already been implemented and (then) exhaustively tested (the "GCD" in area 5). However, it is *not* necessary to wait for a repository siting decision to begin rendering INEEL waste road-ready (the UK didn't) - regardless of exactly where that waste might eventually end up, it is reasonable to assume that HC-type concrete would be at least as durable as glass due to the fact that its mineralogical similarity to natural soil minerals provides less thermodynamic driving force for alteration.

coprocessing these wastes would solve two problems. If the changes to the existing calcination facility I've alluded to were to be implemented, virtually any sort of liquid or particulate waste (e.g., contaminated soils) could be readily converted to HCs.

6) It is probable that a formal proposal to properly implement an HC-type solidification process would satisfy INEEL's stakeholders.

9-55 III.D.2.b(1) 7) If a future generation deems it to be both politically expedient and affordable, HC-type concrete monoliths could be hot-isostatically-pressed into "vitrified" ceramic monoliths without removing them from their original canisters. (In other words, today's decision-makers would not have to make an irrevocable commitment to not "vitrify" this waste).

9-56 III.D.2.b(1) 8) To retain its "lead lab" status, INEEL needs to succeed at doing something. "Direct Cement" would permit it to be the first DOE reprocessing site to render its waste road-ready.

Since this EIS is just a draft, let me suggest the following changes for the final version.

9-57 VII.D(2) First, make it very clear up front just exactly what it is you're trying to accomplish. If it's already been decided that it's OK to **not** honor the commitments made in the "Batt Agreement", say so. (For instance, some of the scenarios in the Draft that still propose that SBW will be calcined, assume a completion time of 2014 AD, not 2012 AD - does this two-year "slip" reflect a change in policy?

9-58 IX.A(3) Second, when you present/discuss treatment scenarios that don't make much sense[10], be sure that you explain the assumptions/conditions that would make them plausible.

9-59 III.D.1(6) Third, you might want to consider integrating some of INEEL's other waste treatment/disposal problems into your final version (e.g. using ANLW's waste caustic as the activator for "hydroceramics" made out of INTEC calcines.) Doing so would prevent a lot of unnecessary duplication, cause a higher percentage of INEEL's radwaste to be prepared for offsite disposal (which would delight local stakeholders), and save taxpayers a lot of money. (The "stove piping" of EM projects to match existing organizational structures/definitions is another of the "symptoms" identified in "*Barriers to Science*").

9-60 III.D.4(6) Fourth, when you present/discuss treatment scenarios that have not received programmatic research support, e.g., "Direct Cement/Hydroceramics", make it clear to the reader that that's indeed been the case & also that information about them can be obtained from sources other than therefore non-existent official Government reports. (For example, I've co-authored/published a dozen open-literature research papers that anyone interested in why "direct cement" makes sense might want to see – the "Draft EIS" doesn't acknowledge that non-government report-type technical literature even exists).

9-61 III.D.4(6) Fifth, to ensure that your EIS-preparation subcontractors do a fairer job of representing alternatives such as "Direct Cement" in the final version, insist that they actually contact the persons responsible for developing/championing them - the "draft" doesn't accurately represent what my colleagues & I have done or would recommend.

9-62 III.F.2(1) Sixth & finally, please don't characterize DOE's decision to tell its employees/contractors to assume that all waste forms made from its reprocessing waste will have 0.5 MTHU per m^3 as being merely "controversial" (p. S-21). A policy that is inconsistent with both the intent and letter of the law (see 40 CFR 191) and which is largely responsible for DOE's inability to deal efficiently with its own "high level" waste requires a more forceful adjective.

9-63 IX.A(2) Do not change your Publisher. The quality of the photography, printing, general layout, etc. of this EIS is the best I've ever seen in a large government-sponsored document.

[10]For instance, the "Minimum INEEL Processing Alternative") suggests that we are to bundle up our calcines into some sort of transportable (you can't ship powders) temporary waste form (RTV-type rubber cement is being studied for this purpose) & then ship it all off to Hanford where they will somehow undo our solidification process, separate the stuff into various fractions, vitrify(?) all of them, and then ship it all back here for a few(?) more decades worth of "interim" storage. This is too clever to make much sense to the casual reader unless considerable additional background information is provided

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9-64 III.D.2.b(1) If you would like to read some technical literature that's not in a DOE-sponsored report, I've written up another research paper (at this point, it's also just a "draft") discussing why "Direct Cement" makes especially good sense for INEEL. It goes into some detail about vitrification's drawbacks (one of which is that its prohibitive cost encourages folks to do "separations") and compares the leach test performance of radwaste type glasses and hydroceramic-type concretes. It's an "easy read" because it's written like the stuff you find in trade journals like *Radwaste Magazine*. Its literature references (35 of them) support the "controversial" contentions I've made in this review. I'll be happy to send you a copy. Want more? I'll also be happy to send you another copy of the report I wrote up for the M&O contractor's HLW department in 1997.

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